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Youth recruitment and retainment in small-scale fisheries: Factors influencing succession and participation decisions in Cameroon

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Abstract

Fisheries systems face enormous pressures from increased fish demand, decreased fish catches, and an ageing fishing population. As a case study, we investigate how climate change stressors, capacity-building opportunities, and the introduction of climate-smart innovations, tools and information may influence youths' succession decisions in small-scale fisheries (SSF). We collected empirical data from a survey with the children of SSF actors to identify the factors promoting or hindering succession in fish harvesting activities through a simple random sampling of 415 youths in six fishing communities in Cameroon. The probit model results revealed that youth participation and succession decisions are positively influenced by their education, nationality, that is, being a migrant, desire to be employed full-time in fisheries-related activities, climate-smart innovations, tools and information, and capacity-building opportunities. Increasing temperatures and uncertainty in fish availability due to climate change negatively influence their succession decisions. We find that parents do not encourage their children to participate in SSF due to climate change impacts, which are reducing fish catch and due to a lack of suitable climate-resilient innovations and capacity-building opportunities. The study provides evidence that interventions that create an enabling environment for youths' participation in fisheries-related activities are important to secure the future of SSF in Cameroon.

KEYWORDS
Cameroon, Central Africa, climate change, climate-smart innovations, small-scale fisheries, succession

1 | INTRODUCTION

Small-scale fisheries (SSF) activities are the backbone of most coastal communities, providing income, food security, and a unique way of life and tradition to those engaged in it (Loring et al., 2013, 2019; Teh et al., 2020). SSF contributes almost 40% of global capture fisheries production and is an important employment opportunity for millions of people worldwide (Arthur et al., 2022; Food and Agriculture Organization [FAO], 2022). The growing demand for fish and fish-related products supports diversified, nutritious food and healthy diets worldwide (Bennett et al., 2018; Béné et al., 2016). However, SSF is considered to be in a "crisis" due to myriad threats from climatic and

non-climatic stressors on fisheries' resources (Adeleke et al., 2021; Béné, 2009; Islam & Herbeck, 2013; Kalikoski et al., 2019). Moreover, depleting fisheries resources and inescapable poverty traps caused by the adverse effects of multiple stressors are outspreading beyond physical impacts to other human dimensions, such as recruitment and retainment of young people in SSF-related activities (El Zoghbi & El Ansari, 2014; McClanahan et al., 2015; Mugambiwa & Dzomonda, 2018).

There is a reported decline in interest from youths to engage in fisheries-related activities, changing historical intergenerational fishing traditions among families (Suh & Nyiawung, 2023; Coleman et al., 2019; Lowe et al., 2012; White, 2015). The decline in interest from youths to participate in the fisheries sector is due to the growing uncertainty in future fish availability (Hasselberg et al., 2020; Power et al., 2014; Worm et al., 2007). However, youths can contribute to the much-needed skills, local ecological knowledge, and fishing heritage by participating and promoting the integration of innovations, adaptability, and sustainability in the SSF value chain (White, 2015). Thus, improving the integration of climate-smart innovations and information and communication technologies (ICT) into SSF is an important pathway to attracting and retaining youths (Suh & Nyiawung, 2023; Arulingam et al., 2019; FAO & WorldFish, 2020). Moreover, youths are ardent technology users with prospects to contribute significantly to climate-resilient SSF (El Zoghbi & El Ansari, 2014). Given that youths are innovative and skillful, they are crucial to the future sustainability of the fish food systems; thus, it is important to explore and elucidate how youths can be encouraged to succeed their parents in fisheries-related activities. Youths have a say in defining their future and contributing to adaptation and climate-resilient strategies for climate change challenges, particularly in sub-Saharan Africa (De Leeuw et al., 2015; Fry et al., 2021; United Nations, 2013).

This study reports research conducted with youths in six coastal small-scale fishing communities in Cameroon. SSF in Cameroon consists of fish harvesters—mainly men, and fish processors/traders—predominantly women (Nyiawung et al., 2022). The men mount their nets and fishing baits on wooden motorised or paddle canoes. Typically, fish harvesters go to sea at night and return to the beachfront at dawn, where they sell their fish to fishmongers (Figure 1). In Cameroon, women process and smoke their fish using firewood in their kitchen. Women equally participate in the fish trade, selling their fish in local fish markets and across borders to neighbouring countries (Ayilu & Nyiawung, 2022). The children of these SSF actors support them in all fisheries-related activities, contributing to the much-needed labour in the sector.

In this study, we aim to fill the gap by examining how the decisions around the recruitment and retainment of the present and next generation of youths will be affected by multiple complex climate change issues, lack of capacity, and lack of climate-smart innovations and tools within the fisheries system in Cameroon. Hence, we explore the extent to which aspects such as socioeconomic factors, climate change stressors, capacity-building opportunities, and the introduction of climate-smart innovation, tools and information services may influence youths' decisions to participate and succeed their parents in SSF activities in Cameroon. Here, we used the term potential successor to refer to a youth/child of a SSF actor who might be willing to succeed their parents and participate in fisheries-related activities. We conducted in-person field surveys with youths whose parents are directly engaged in fish harvesting activities in Cameroon to investigate their decisions to participate/succeed their parents. This study is crucial, especially for countries in the Global South, where climate change stressors affect SSF's livelihood, increasing uncertainty for potential successors to participate in fisheries-related activities. Moreover, the findings will contribute to the growing discussions on the future of SSF (Pauly, 2018), but more importantly, the findings will shed more light on the multigenerational consequences of fisheries management policies in SSF value chains in the Global South.

2 | MATERIALS AND METHODS

2.1 | Contextualisation of research

Increasingly, there is a reported decline in the rates of recruitment and retainment of youths in fisheries-related activities (Suh & Nyiawung, 2023; Coleman et al., 2019; Neis et al., 2013; White, 2015). In addition, little is known concerning the many drivers that influence youths to be discouraged or uphold intergenerational continuity within SSF value chains (Power et al., 2014; White, 2015). While there is limited scholarly literature on youths' willingness to participate in fisheries-related activities globally (Suh & Nyiawung, 2023; Coleman et al., 2019; Khan & Neis, 2010; Lowe et al., 2012; Sereenonchai & Arunrat, 2019; Sumaila, 2004; White, 2015), there is no literature on youths' willingness to succeed in SSF in Cameroon and Central Africa. For instance, White (2015) examined why youths are reluctant to engage in fisheries in East England and found that succession in the fisheries sector approach through father-to-son pathways is increasingly uncommon. Coleman et al. (2019) studied youths' attitudes toward succession and barriers to entry in fisheries in the United States. They found that experience in fishing, the role of fishing to the youths' families, and the youths' desire to be involved in fishing influenced their succession decisions. Moreover, they reported that youths were highly uncertain about their future. Coleman et al.'s (2019) findings also revealed that family ties to fishing and exposure to the fishing communities were key aspects influencing youths' engagement in fishing in the future.

Relatedly, Espinoza-Tenorio et al. (2022) in Mexico studied aspects of uncertainty and hope for youths in sustainable SSF and found that climate change is the greatest external threat to fishing, hindering the ability of youths to continue in SSF-related activities. They also found that despite the impact of climate change, some youths participated in SSF because of historical ties to fishing since childhood. At the same time, other youths were also willing to abandon the sector if they found better-paid jobs. Sereenonchai and Arunrat's (2019) research in coastal Chumphon province, Thailand, shows that fishers with higher incomes want their children to engage in fishing. Further, Khan and Neis (2010) also highlighted the need for efforts to rebuild fish stocks by considering the sustainability of the next

FIGURE 1 Fish harvesters at Down Beach (Limbe, Cameroon) returning after a fishing trip with their wooden boats, and smoke from firewood coming out of fishmongers' kitchens.

generations and communities as beneficiaries. Lowe et al. (2012) studied Alaska coastal community youths and their future. They suggested that youths should be engaged in education career paths rather than staying in the fishing sector due to declining fish catches. Sumaila (2004) also argued the need to integrate an intergenerational approach in the traditional cost–benefit analysis of fisheries food systems to highlight benefits and allocate the cost of rebuilding fish stocks across generations.

However, the challenges/sustainability issues within SSF can be addressed by introducing climate-smart innovations and ICT technologies, focusing on youths and intergenerational continuity. There is a growing literature on the potential role of climate-smart innovations and ICTtechnologies in promoting sustainable fish management in fish food systems (e.g., Arulingam et al., 2019; Bradley et al., 2019; Calderwood, 2022; Dircke & Molenaar, 2010; FAO & WorldFish, 2020; Gutowsky et al., 2013; Hall et al., 2013; Jensen, 2007; Mulumpwa, 2020). For example, Calderwood (2022) highlighted the role of smartphone applications in supporting climate-smart fishing by providing relevant information on climate change, improving value chains, and reducing postharvest losses for fishers. The FAO and WorldFish (2020) have suggested evidence of ICT technologies that might support and improve sustainable SSF practices, such as providing climate change information. Moreover, Arulingam et al. (2019) found that increased integration of ICT technologies in SSF is considered a pathway through which SSF can attract and retain more youths. Jensen (2007) studied the role of digital technologies on the welfare of fishers in South India and reported that the adoption of mobile phones by fishers was associated with fisheries waste elimination and improved fishers' well-being.

Further, Mugambiwa and Dzomonda (2018) emphasised the role of capacity-building and skills development for youths as triggers to curb future climate change impacts. Moreover, some scholars have investigated the role of capacity-building opportunities and skills acquisition in supporting youth participation in SSF (Espinoza-Tenorio et al., 2022; Neis et al., 2013). Espinoza-Tenorio and colleagues found that youths were willing to participate and continue in SSF, provided they could receive training on the rational use of resources and climate change. Also, Neis et al. (2013) studied SSF in Newfoundland and Labrador and Northern Norway. They reported that, in some communities, summer youth fishery training programmes that aimed to equip youths with fisheries skills and finance youth's fishery projects contributed to recruitment and retainment in SSF. Related to the Cameroon study context, Suh and Nyiawung (2023) examined climate change dynamics and youth participation decisions in SSF in The Gambia and showed that youths were discouraged by household members from participating in fisheries-related activities due to climate change impact and declining fish catch. However, they found that training opportunities on climate resilient approaches, including the introduction of climate-smart innovations and climate change adaptation strategies, may positively influence youth participation decisions.

However, compared to other agricultural activities and aquaculture, few studies have been conducted on the implications of climate-smart innovations, ICT technologies, capacity-building opportunities, and policies that provide incentives to foster transformational changes in SSF. Creating an enabling environment for digital innovations will increase fish productivity, reduce climate change impacts, and promote youth succession in SSF. This study seeks to fill the gap of limited

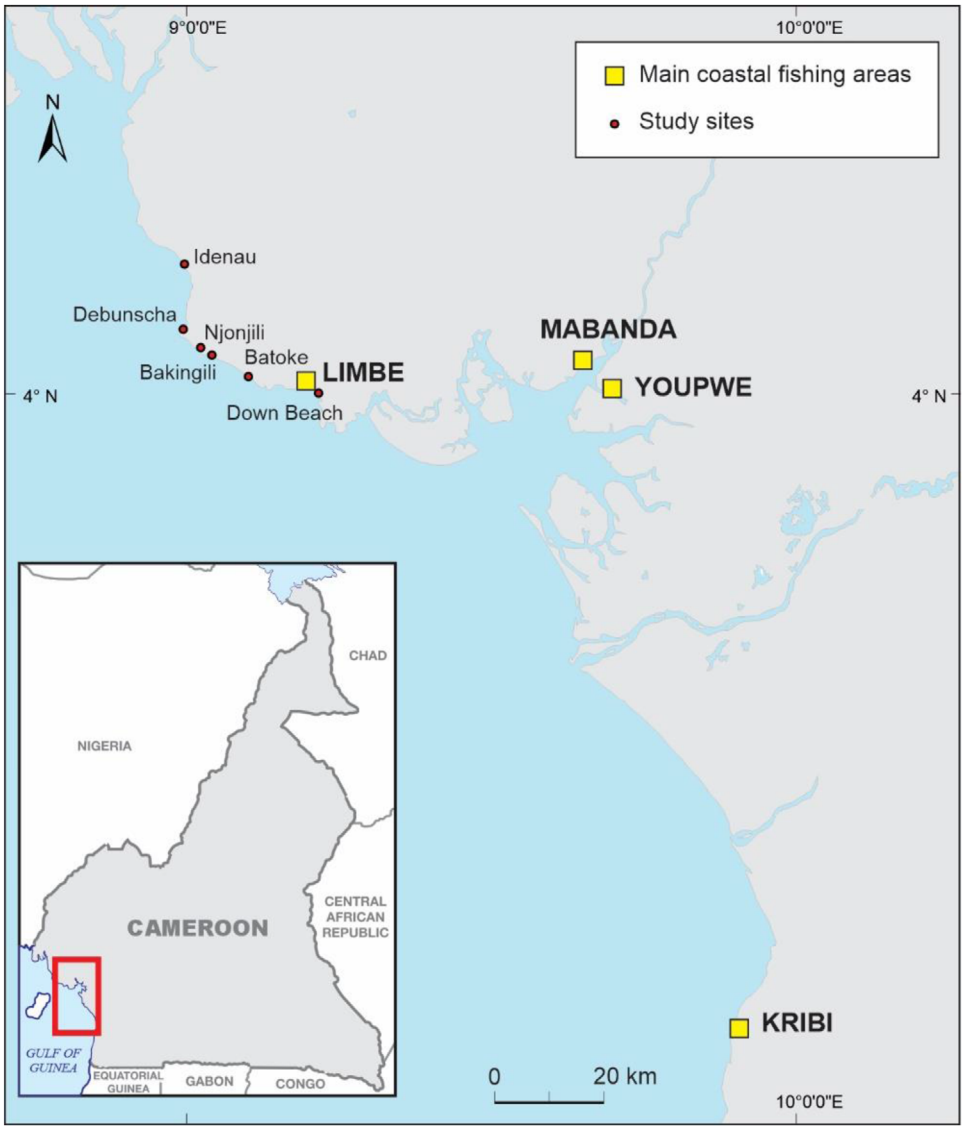

FIGURE 2 Study area—Limbe, South-West Cameroon.

scholarly literature on youth succession in SSF-related activities. With the increasing reluctance of youths to succeed in fisheries-related activities, this study examines the role of socioeconomic factors, climate change, climate-smart innovations, tools and information, and capacity-building opportunities to promote youth succession in SSF in Cameroon.

2.2 | Survey and sampling methods

Youths from six different fishing communities in Cameroon participated in this research (Figure 2). The six sampling units are in Limbe, South-West Region of Cameroon (i.e., Idenau, Debunscha, Njonjili, Batoke, Bakingili, and Down Beach). Data were collected from youths whose families have a strong intergenerational tie with fishing. In Cameroon, males are engaged solely in fish harvesting, while females are engaged predominantly in fish processing/trade. In this study, we focused on the potential successors of fish harvesters who are predominantly male. The categorisation of youths differs within context, and countries and organisations have adopted different categorisations, generally between the ages of 15 and 35 (Amsler et al., 2017; Fry et al., 2021). This study considered youths to be between the ages of 15 and 35. These are youths still living with their parents, assisting their parents in fish harvesting activities, and/or operating/managing their parents' canoes. Previous research in these locales with fisheries actors identified their unwillingness to allow their children to engage in fisheries activities (Nyiawung et al., 2022, 2023). To explore this problem, we used a structured questionnaire and a simple random sampling approach to survey approximately 70 youths from the six fishing communities. Youths were randomly approached at the beachfront and in the communities, while helping their parents in fish harvesting and/or fish-processing activities. Surveys were conducted between March and May 2022. A total of 415 questionnaires were completed and retained for analysis. The survey

TABLE 1 Variables used in the probit model.

Variable	Description	Unit of measure
Succession	Potentials successors' succession decisions	1 = if willing to succeed; 0 = otherwise
Employment	Potential successors desire to participate in fish harvesting	1 = if full-time; 0 = otherwise
Migrant	Potential successor is a migrant (Nigerians and Ghanaians) or local (Cameroonians)	1 = if migrant; 0 = if local
Marital status	The marital status of the parent of the potential successor	1 = if married; 0 = if otherwise
Temperature	Perception of increasing temperature	1 = if increasing; 0 = if otherwise
Water	Perception of increasing water volume	1 = if increasing; 0 = if otherwise
Fish catch	Change in fish catch due to climate change stressors like temperatures and rainfall	1 = if increasing; 0 = if otherwise
Innovative	Access to sure, available and low-priced innovative fishing methods, tools and information will influence succession decisions	1 = if influence; 0 = if otherwise
Age	Age of the potential successor	Years
Education	Years of formal schooling of the potential successor	Numbers
Parent's experience	Potential successors' parents' fish harvesting experience	Years
Risk	Potential successors consider the growth and availability of capture fisheries in the future as a high-risk activity due to climate change stressors	1 = if risky; 0 = if otherwise
Capacity	Training on innovative fishing methods is important to influence potential successors' succession decisions	1 = if important; 0 = if otherwise

reported information on socioeconomic characteristics, participation, and succession decisions, including climate change and climate-smart innovations.

2.3 | Empirical framework

Recruiting and retaining youths in fisheries-related activities helps ensure continuity and participation in SSF (White, 2015). Considering that potential successors can decide not to succeed their parents or decide to succeed their parents, a probit choice model is most suitable for exploring the factors that influence potential successors' decisions to settle on their preferred choice. The probit model was adopted to investigate youths' decisions to succeed or not to succeed since it is easier to interpret its coefficients, and it is also very sensitive to outliers (Chen & Tsurumi, 2010). Thus, the probit regression model was used to explore the implications of climate-smart innovations, climate change stressors, capacity-building opportunities, and socioeconomic variables on the succession decisions of potential successors in SSF in Cameroon. The variables used in this study are presented in Table 1.

Data were analysed using Excel and STATA 15 software. This study adopted the probit modelling technique, which specifies that if there are two choices to be made, the model takes the form:

$$Y_i^* = \beta_i X_i + \varepsilon_i, \tag{1}$$

$$Y_i = \begin{cases} 1, \ if\ Y_i^* > 0 \\ 0, \ if\ Y_i^* < 0 \end{cases}, \tag{2}$$

where Y_i represents the ith potential successors' decision to succeed or not to succeed in fisheries-related activities, X_i is a set of independent variables that may affect the potential successors' succession decisions, beta (β_i) refers to the coefficients of the independent variables and epsilon (ε_i) is the error term.

The probability that a potential successor i succeed their parents in fisheries-related activities ($Y_i = 1$) is given by:

$$\begin{aligned} \Pr[\,Y_i = 1] &= \Pr\left[Y_i^* > 0\right] \\ &= \Pr\left[\beta_i X_i + \varepsilon_i > 0\right] \\ &= 1 - \Pr\left[\varepsilon_i \le -\beta_i X_i\right] \\ &= F\left[\beta_i X_i\right] \\ &= \int_{-\infty}^{\beta_i X_i} \frac{1}{\sqrt{2\pi}} \exp\left(-\frac{z^2}{2}\right) dz, \end{aligned} \tag{3}$$

where Z is the standard normal distribution [$Z \sim N\ (0, \sigma^2)$], Pr is the probability that the ith potential successor is willing to succeed and 0 otherwise, and $F\ (\beta i X_i)$ is the cumulative distribution function.

Contextualising the probit model to fit our study, we expressed the model empirically as follows (see Table 1):

$$\begin{aligned} Y_{ij} = \beta_0 &+ \beta_1 mar + \beta_2 edu + \beta_3 empl + \beta_4 migrant + \beta_5 exp + \beta_6 age \\ &+ \beta_7 temp + \beta_8 risk + \beta_9 innov + \beta_{10} cap + \beta_{11} wat + \beta_{12} fish + \mu, \end{aligned} \tag{4}$$

TABLE 2 Factors influencing succession and participation decisions in small-scale fisheries (SSF).

Variable	Mean	S.D.
Employment	0.28	0.45
Migrant	0.78	0.41
Marital status	0.56	0.49
Temperature	0.82	0.39
Water	0.39	0.49
Fish catch	0.07	0.26
Innovative	0.84	0.37
Risk	0.37	0.48
Capacity	0.21	0.41
Age	23.8	6.29
Education	11.4	3.6
Parent's experience	20.5	8.7

Note: S.D. is the standard deviation.

where *mar* is the marital status of parents; *migrant* is the potential successor is a migrant; *edu* is the years of schooling of the potential successor; *empl* is the potential successor desire to participate full-time in fish harvesting activities; *temp* is the perception of increasing temperature; *innov* is access to innovative fishing methods, tools and information; *age* is the age of the potential successor; *exp* is the fish harvesting experience of the potential successors' father; *risk* is potential successor considers the growth and availability fish a threat; *cap* is training on innovative fishing methods; *water* is water volume is increasing; and *fish* is the change in fish catch due to climate change stressors. β_i are the parameters to be estimated, and μi is the error term.

3 | RESULTS

3.1 | Descriptive statistics of factors influencing youth succession decisions

Table 2 shows the descriptive statistics of factors influencing youth succession decisions in fish harvesting activities. About 78% of the fishing households surveyed are migrants from Nigeria and Ghana, while just 28% of potential successors surveyed desired to be engaged full-time in fish harvesting activities. Most of the potential successors' parents are married (56%). Approximately 82% of potential successors perceived temperature to be increasing, while 39% perceived increasing water volume. About 93% of potential successors experienced decreases in fish catch due to the impacts of climate change stressors like increasing temperature and changing rainfall patterns. Almost 84% of the potential successors surveyed reported that access to climate-smart and innovative fishing methods and information such as advanced refrigerators, mobile smartphone applications, and the Internet to monitor daily weather information would influence their decisions to participate in fish harvesting activities. Approximately 37% of the potential

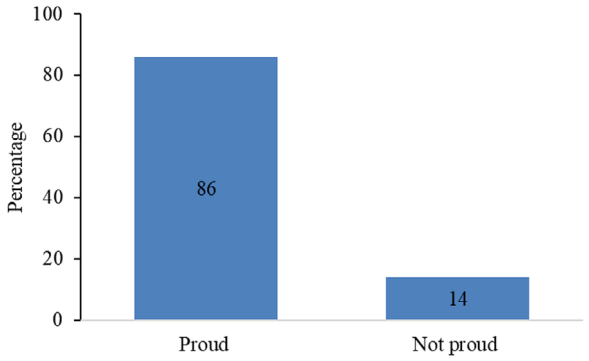

FIGURE 3 The percentage of fish harvesters who will not be proud if their children succeed in fishing.

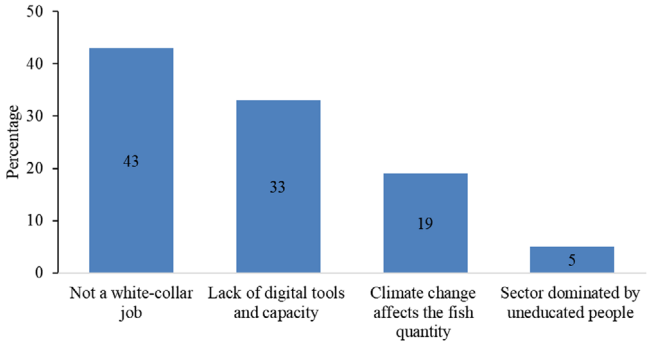

FIGURE 4 Reasons for not encouraging potential successors to engage in fisheries-related activities.

successors consider the growth and availability of capture fisheries in the future as a high-risk activity due to climate change stressors. About 21% of the potential successors believed that training on innovative fishing methods is important to influence youths' succession decisions. Other variables of interest are indicated in Table 2.

3.2 | Perceptions of fish harvesters concerning the succession decisions of their children

As reported by the potential successors, Figure 3 shows the different percentages of the current fish harvesters who will not be proud or encourage their children to succeed them after they retire due to the challenges of climate change, declining fish catches, lack of climate-smart innovations, and capacity-building opportunities in SSF. About 14% of the current fish harvesters are unhappy if their children continue in the fisheries sector. This is reportedly due to fisheries-related livelihood challenges and the increasing impacts of climate change, which reduced fish catch.

Based on surveys with the potential successors, the 14% group of fish harvesters who are not encouraging their children to succeed in fisheries activities is due to several reasons presented in Figure 4. Based on interactions of the potential successor with their parents, 43% of the potential successors mentioned that their parents have

often raised issues of the fisheries sector not being considered a decent job sector. Moreover, about 33% raised issues concerning lack of access to climate-smart innovations and capacity-building opportunities, 19% were due to the adverse impact of climate change stressors on fish productivity and catch quantity, and 5% perceived that the sector is dominated by uneducated people.

3.3 | Probit model

Table 3 reports the fitted results for the probit model for potential successors' willingness to participate and succeed or not to succeed in fish harvesting activities. The chi-square results demonstrate high statistical significance for the likelihood ratio ($p < 0.01$), indicating strong explanatory power for the factors explaining potential successors' decisions to succeed or not succeed. The results show that most of the explanatory factors are statistically significant at 1%, with the signs as expected, except for a few. We found that the education of the potential successor, potential successors from migrant fishing households, potential successors who desire to be employed full-time in fish harvesting activities, climate-smart and innovative fishing methods, and capacity-building opportunities positively and significantly influenced potential successors' decisions to succeed in fish harvesting activities. Further, our findings suggest that uncertainty in future fish availability due to climate change stressors and perception of increasing temperatures negatively and significantly influenced potential successors' decisions to succeed in fish harvesting activities.

TABLE 3 Probit model for potential successors' willingness to succeed or not to succeed in SSF.

Variables	Coefficients
Socioeconomic factors	
Marital status	0.24 (0.18)
Age	0.02 (0.02)
Education	0.11*** (0.02)
Employment	0.46** (0.21)
Migrant	0.42** (0.19)
Parent's experience	0.01 (0.01)
Climate change variables	
Temperature	−0.74*** (0.29)
Risk	−0.56*** (0.17)
Water	−0.11 (0.19)
Fish catch	−0.12 (0.31)
Digital innovation and capacity building	
Innovative	1.44*** (0.21)
Capacity	0.85*** (0.28)
Constant	0.24 (0.56)
Log-likelihood value	−152.06
Chi square	179.89
Prob > chi^2	0.00
Pseudo *R*-squared	0.37
Number of observations	415

Note: Robust standard errors in parentheses.
***$p < 0.01$; **$p < 0.05$; *$p < 0.1$.

4 | DISCUSSION

Through household surveys, our results show that fish harvesters are not willing to allow their children to succeed in fisheries-related activities but to seek other employment opportunities due to declining fish catches and livelihood challenges. However, we found that introducing climate-smart innovations and capacity-building opportunities can influence potential successors' decisions to engage in SSF. We summarise the discussion of our results in three folds: (a) perception of fish harvesters on the succession decisions of their children, (b) the implications of climate change, climate-smart innovations and tools and capacity-building opportunities on succession decisions, and (c) the implications of socioeconomic variables on succession decisions.

First, our research revealed that fish harvesters are not encouraging their potential successors to succeed them in fish harvesting activities mainly due to the uncertainty and risk in future fish availability caused by the unfolding impacts of climate change. The impacts of climate change present a threat to the lives and livelihoods security of those engaged in fishing, thus discouraging potential successors from participating in the sector. This is consistent with Coleman et al.'s (2019) research that found that fish harvesters discouraged their children from fishing due to financial and physical risks. Relatedly, White (2015) studied intergenerational continuity in fishing communities in the United Kingdom and reported that few fishers were keen on encouraging their sons to succeed in fishing due to sustainability issues. Moreover, Trimble and Johnson (2013) found that most fishers were unwilling to encourage their children to succeed in fisheries in Uruguay and Brazil due to declining fish catch, unstable fish income, and low food purchasing ability. We also found that most of the potential successors' parents have been engaged in fish harvesting for over 20 years. However, there was no significant association between the years of fishing of the potential successors' parents and the potential successors' succession decisions. Relatedly, this finding contradicts Colemen et al.'s (2019) reports that youths with fishing experience were more likely to succeed in fishing than youths without fishing experience.

Second, uncertainty in future fish availability due to climate change stressors such as sea level rise, increasing temperatures, changing rainfall patterns, heavy storms, and increasing water salinity was negatively associated with potential successors' decisions to succeed in fish harvesting activities. This indicates that potential successors who do not consider SSF activities in the future as high-risk activities due to climate change impacts are more likely to succeed their parents. The increasing occurrence of these climatic stressors increases the risk at sea, reduces fish catch, and increases the risk to the lives of the fish harvesters, thus discouraging fishing households' historical commitments to continue fishing. Similar to the findings of Espinoza-Tenorio et al. (2022) in Mexico, climate change stressors are likely to threaten the ability of youths to continue in SSF. Moreover, after two decades of decline in fish catch, starting in 2009, Neis et al. (2013) found that in Newfoundland and Norway, there was some reversal in the declining recruitment and retainment of youths into SSF. This was mainly due to recent increases in the size of fish caught and intergenerational ties to fishing. We found that the perception of increasing temperatures showed a negative association with potential successors' decisions to succeed in fish harvesting activities. Given that potential successors perceive an increase in temperature, they are forecasting an even more decline in fish catch, hindering their succession decisions. Our results are similar to Adeleke et al. (2021), who revealed that increasing temperatures, wind and storms, waves, sea level rise, and changing rainfall patterns reduce fish availability and catch in Nigeria. Furthermore, Potts et al. (2015) also highlighted that the current increase in water temperatures adversely affects fish larval mortality rate, consequently reducing fish availability.

Lack of access to climate-smart innovations, tools and information were some of the concerns raised by potential successors as the reason for not desiring to participate in fisheries-related activities in the future. It has been established elsewhere by Espinoza-Tenorio et al. (2022) in Mexico that youths engaged in SSF used social network platforms like Facebook to get fishing information. We found that access to subsidised or low-priced innovative fishing methods, tools and information was positively associated with potential successors' decisions to succeed in fish harvesting activities. Moreover, approximately 84% of the potential successors indicated that access to sure, available and low-priced digital innovative fishing methods, such as smartphone mobile applications and information, would positively influence their decisions to succeed their parents. This may be because innovative fishing methods will promote secure and sustainable fishing practices that help address some of the climate change stressors and improve livelihood and income from fisheries-related activities. Our findings indicated that most potential successors have attended at least secondary education (mean years of schooling is 11 years) and can read and write well. Thus, there is a high prospect that these potential successors can contribute significantly to climate-smart and resilient strategies in SSF. These findings corroborate recent studies by Suh and Nyiawung (2023) in The Gambia. Moreover, youths are skillful, innovative, and ardent technology users with prospects to contribute significantly to climate-resilient strategies in SSF (El Zoghbi & El Ansari, 2014; White, 2015); thus, ensuring access to climate-smart innovations, tools and information can foster the participation of potential successors in SSF in Cameroon. This result aligns with recent studies by Fry et al. (2021), who highlighted that improving youths' access to finance, livelihood assets, better infrastructure, and capacity-building in digital marketing is important in facilitating youths' inclusion in the fish food systems in Nigeria. Also, according to Arulingam et al. (2019), youths are early adopters of ICT technologies; thus, expanding the use of information dissemination and the adoption of technologies in SSF can support youths' participation in the sector.

Access to capacity-building opportunities was positively associated with potential successors' decisions to succeed in fish harvesting activities. This shows that the more the certainty that a potential successor will get training on innovative and sustainable fishing methods that are climate-friendly, the higher the relative probability of succeeding their parents. Training potential successors on climate-smart fishing methods may improve their coping and adaptation strategies and, in turn, improve their livelihood. Our findings are similar to the work of Denton et al. (2014), who reported that human capital development through training and financial assistance is important to improve climate risk management and adaptive responses. Moreover, Neis et al. (2013) and Okon and Nsa (2012) found that the youths emphasised the importance of fish training schools to be vital to ensure sustained youth participation in fisheries-related activities.

Third, years of schooling of potential successors showed a positive association with potential successors' decisions to succeed in fish harvesting activities. Moreover, the mean year of schooling of potential successors was 11 years, indicating that more educated youths were willing to succeed their parents provided they are equipped with skills that can support sustainability in SSF. Thus, more educated potential successors may be more aware and knowledgeable of the implications of climate change and livelihood challenges and more efficient in managing and coping with these challenges, influencing their succession decisions. This aligns with a report from the United Nations (2013) highlighting that education is an important pathway to sustainable management of climate change impacts for youth. Also, this adds to the findings from other studies in Asia, Africa, and the Pacific, where Fry et al. (2021) highlighted the relevance of education to reducing exposure to traditional and ecological forms of knowledge related to fishing, generally improving youths' fishing methods and approaches.

Finally, our results showed that potential successors willing to participate and succeed in fisheries-related activities on a full-time basis are more likely to engage in fish harvesting in the future than those willing to engage part-time in fishing. Also, potential successors who are migrants from Nigeria and Ghana are more likely to engage in fish harvesting activities than locals (Cameroonian). This implies that potential successors who are locals are less likely to succeed their parents compared to migrant youths. These migrants have limited livelihood options and may be more willing to stay in the fisheries sector despite declining catches. Moreover, these migrant fish harvesters migrated to Cameroon purposely for fishing, with more of their children willing to succeed in fishing activities than locals. Contrary to our findings,

Coleman et al. (2019) highlighted that locals (natives) in fishing communities in the United States slightly influenced youths' decisions to engage in industrial fishing in the future.

5 | CONCLUSION

Recruiting and retaining youths in SSF needs immediate attention. Youths are the engine of transformation through their skills and ability to integrate and promote climate-smart innovations and sustainability in the SSF value chain, although they are still invisible in the fisheries systems in practical terms. We examined the different environmental and social factors influencing youths' succession and participation decisions in SSF in Cameroon, where there is a growing concern about intergenerational continuity in fish harvesting activities. Also, we investigated the causes of declining interest from potential successors to succeed their parents in fish harvesting activities and found that the primary cause is increasing climate change-related impacts, which create uncertainty about future fish availability and challenges to local economic livelihoods. The results show that the years of schooling of potential successors, migrant fishing households, potential successors who desire to be employed full-time in fish harvesting activities, climate-smart and innovative fishing methods, tools and information, and capacity-building opportunities positively influenced potential successors' decisions to succeed in fish harvesting activities. The uncertainty in future fish availability due to climate change stressors and the perception of increasing temperatures negatively influenced potential successors' succession decisions. Therefore, to bridge the gap between succeeding and not succeeding in SSF, youths should be considered in policies and programmes that seek to sustainably equip youths with capacities to engage in fish harvesting activities.

The study shows that institutionalising climate-smart innovations and information and capacity-building opportunities are important to ensure a sustainable and climate-resilient fish food system. Moreover, there is a need to create an enabling environment that equips youths with the skills needed to engage successfully in the fisheries sector. For example, creating and using innovative approaches such as weather information systems, advanced refrigerators, and mobile smartphone applications for fisheries can go a long way to ensure resilience to climate change impacts for small-scale fishers and improve livelihood security. Also, innovative platforms to bring parents and youths to share common ideals and improved innovative information dissemination can be set up in fishing communities to foster potential successors' participation, leadership, and succession in SSF.

From our findings, we suggest that policies should focus on the immediate short- and long-term climate-resilient strategies to curb the adverse impacts of climate change. To support succession for potential successors in SSF, we recommend improving access to climate-smart innovations and promoting capacity-building. Policies in the fishing sector should consider an approach that will be inclusive of all the actors in the fish value chain, and youths should be at the forefront of deciding the future they want through guidance from researchers and policymakers, who together should prioritise a sustainable link between coastal communities and fishing livelihoods. Last, to foster the transition from one generation to another in SSF, policies must adequately prepare and support youths to claim a way of life that is tied to intergenerational continuity and fundamental to supporting sustainable fisheries and fostering employment and food security.

AUTHOR CONTRIBUTIONS

Neville N. Suh: Conceptualisation; data curation; formal analysis; investigation; methodology; project administration, supervision; software, visualisation; writing—original draft; writing—review and editing. **Bessy T. Efed**: project administration. **Richard A. Nyiawung**: Conceptualisation; methodology; project administration; supervision; writing—original draft; writing—review and editing.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

Data will be made available upon request.

ETHICS STATEMENT

This study applied and received the University of Guelph Research Ethics Board's certificate of ethical acceptability of research involving human participants—REB#20-12-011.

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